8.5 Noise

The Henrietta Peaker Project (HPP) consists of a 91.4-megawatt (MW) (net), natural-gas-fired, simple-cycle power plant located approximately 10 miles southwest of Lemoore, California, on a seven-acre portion of a 20-acre parcel owned by GWF Energy LLC. The HPP will interconnect to the existing adjacent Pacific Gas and Electric Company (PG&E) Henrietta Substation through a new 550-foot 70-kilovolt (kV) transmission line supported on two new transmission poles. Other linear facilities include an approximately 16.5-foot water interconnection pipeline (from the site property boundary) and a 2.2-mile Southern California Gas Company natural gas interconnection pipeline. Additionally, approximately five acres will be used for temporary construction laydown and parking.

8.5.1 Affected Environment

The proposed site and vicinity are a mix of rural, industrial, and residential areas. The nearest residential area is the Naval Air Station (NAS) Lemoore housing, located approximately 1.5 miles northeast of the site. The acoustical environment is influenced by typical rural sources, such as birds, insects, wind, occasional traffic along State Route 198 and the Avenal Cutoff, occasional military aircraft, and an existing substation.

The proposed facility will use two simple-cycle combustion turbine generators (CTGs). The major noise sources associated with the proposed facility are anticipated to include the CTG packages, the turbine exhaust stacks, the fuel gas compressor building, the fuel gas cooler, and the generator step-up transformers.

The anticipated environmental noise levels associated with the proposed facility have been evaluated with respect to the applicable laws, ordinances, regulations, and standards (LORS). LORS are described in Section 8.5.6 and summarized in Table 8.5-7.

8.5.2 Acoustical Terminology

Sound levels are measured in decibels (dB) using a logarithmic scale. The standard measure for environmental sound levels is the A-weighted sound pressure level (dBA).

The A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels.

The background environmental sound level is the quasi-static sound level that exists in the absence of sporadic and transient noise events such as local traffic, aircraft flyovers, etc. The background sound level itself varies slowly with time as these sources increase or diminish. The statistical sound level typically considered representative of the background sound level in environmental settings is called the L_{90}; this sound level is the level that is exceeded 90 percent of the time during a given interval.

The true energy average level over a specific time period is defined as the equivalent level, L_{eq}. The equivalent level is the perfectly constant level containing the same acoustic energy over the same interval as the fluctuating interval. Hence, the L_{eq} sound level provides a measure of the true average sound level and includes all sporadic or transient events during the interval. In environmental settings, L_{eq} is usually measured in hourly intervals over long periods in order to determine 24-hour sound levels.

The day-night sound level, L_{dn}, is the 24-hour measure specified in the Kings County Noise Element and is used by the U.S. Environmental Protection Agency (U.S. EPA) and other federal agencies. This noise descriptor is the equivalent noise level over a 24-hour period that is mathematically weighted during the nighttime when residents are more sensitive to intrusive noise. The daytime period is from 7:00 a.m. to 10:00 p.m., and the nighttime period is from 10:00 p.m. to 7:00 a.m. A weighting factor of 10 dB is added to all sound levels that occur during the nighttime period. The weighted levels over a 24-hour period are then averaged to determine the L_{dn} sound level.

An additional 24-hour measure specified in the Kings County Noise Element is the community noise equivalent level, CNEL. CNEL is very similar to L_{dn}, except that an additional weighting factor of 5 dB is added to the evening period of 7:00 p.m. to 10:00 p.m. Accordingly, the daytime period is shortened to 7:00 a.m. to 7:00 p.m. Measurements of both CNEL and L_{dn} sound levels in the same residential environments indicate that the CNEL sound level is typically only slightly higher (by less than 1 dB) than the L_{dn} sound level due to the evening weighting.

8.5.3 Ambient Noise Survey

An ambient noise survey was conducted on June 6 and 7, 2001 to characterize the existing acoustical environment within the vicinity of the proposed site. Three noise measurement locations were selected to capture an acoustical environment representative of the site and the nearest noise-sensitive receptors. A description of each measurement location is provided in Table 8.5-1; the locations of nearby residences and noise monitoring locations are shown on Figure 8.5-1. Weather conditions were conducive to ambient noise surveying and generally included clear skies, occasional light breezes, and temperatures ranging from 68 to 88 degrees Fahrenheit.

Continuous monitoring was conducted at each location for a minimum duration of 25 hours to capture typical ambient daytime and nighttime sound levels. The measurements included the hourly L_{eq} and L_{90} sound levels. The hourly L_{eq} sound levels are used to determine the L_{dn} and CNEL levels, whereas the hourly L_{90} sound level represents the background levels. Additional parameters were recorded, including the hourly L_{10} and L_{50} sound levels. The L_{10} level is the sound level exceeded 10 percent of the period and is typically considered the intrusive sound level. The L_{50} sound level is the level exceeded 50 percent of the period and represents the median sound level. The noise monitoring results are detailed in Table 8.5-2 and on Figure 8.5-2.

The acoustical environment at the nearest residential area (Location 1) was influenced by traffic along State Route 198 and other nearby roadways, traffic and facilities associated with NAS Lemoore, occasional military aircraft, and natural sounds (birds, insects, wind, etc.). As listed in Table 8.5-2, the quietest background sound level for Location 1 was approximately 41 dBA and occurred during early morning hours (2:00 to 3:00 a.m.)

8.5.4 Environmental Consequences

8.5.4.1 Operational Noise Levels

The facility noise emissions were modeled using noise prediction software. The software simulated the outdoor propagation of sound from each point source and accounted for sound-wave divergence, atmospheric sound absorption, sound directivity, and sound attenuation

due to interceding barriers. A database was developed that specified the location, octave-band sound power levels, and sound directivity of each noise source. A receptor grid was specified that covered the entire project area. The model calculated the overall A-weighted sound level at each receptor location based on the octave-band sound-level contribution of each noise source. Finally, a noise contour plot was produced based on the overall A-weighted sound level at each receptor location. Noise modeling was conducted to predict the facility noise emissions during normal facility operation, which excludes intermittent activities such as startup, shutdown, and any abnormal or upset operating conditions.

The primary noise sources anticipated from this facility are the CTG packages, the exhaust stack packages, the generator step-up transformers, the fuel gas cooler, and the fuel gas compressor enclosure. Equipment sound levels were based on available manufacturer's equipment data, available in-house data, or empirical data provided by the Edison Electric Institute (EEI, 1984). The sound-level data for the major equipment are listed in Table 8.5-4.

The predicted environmental noise emissions during normal operation of the proposed facility are detailed on Figures 8.5-3 and 8.5-4. As shown on Figure 8.5-3, the A-weighted sound level at the nearest noise-sensitive receptor is approximately 32 dBA. As shown in Table 8.5-5, this results in an increase in the existing background sound level of approximately 0.5 dB, an inaudible increase. In addition, the predicted future background sound level of 41.5 dBA corresponds to L_{dn} and CNEL sound levels of 47.9 dBA and 48.1 dBA, respectively. These levels are within the "acceptable" limit of L_{dn} / CNEL 60 dBA prescribed by the Kings County Noise Element (further described in Section 8.5.7.3, below) and the guideline of L_{dn} 55 dBA recommended by the U.S. EPA (Section 8.5.7.1).

The switchyard is located on the north side of the HPP adjacent to the existing substation. Sound levels associated with the switchyard and transmission line will be less than HPP operational noise and therefore inaudible at the nearest residence, which is 1.5 miles away.

As shown on Figure 8.5-4, the A-weighted sound level ranges from approximately 47 to 63 dBA. The higher sound levels are anticipated to occur along the boundaries nearest the major equipment. Accordingly, the corresponding L_{dn} and CNEL sound levels along the boundary will reach 69.4 dBA and 69.6 dBA, respectively. These levels comply

with the "acceptable" limit of L_{dn} / CNEL 70 dBA prescribed by the Kings County Noise Element.

As shown in Table 8.5-4, there are generally no noise emissions associated with the HPP equipment. Although the transformers may tend to radiate a 120-hertz tone, the tone will be inaudible at noise-sensitive receptors.

8.5.4.2 Worker Noise Exposure

Power plant equipment can typically be provided that does not exceed an average sound level of 85 dBA at 3 feet from the equipment face and 5 feet above the ground or personnel platform. However, the noise levels in some areas within a power plant typically exceed 85 dBA, due to the additive effect of nearby equipment as well as the effect of sound reflection and reverberation. Special noise control measures, such as silencers, acoustical enclosures, insulation, or acoustical lagging, may be considered to reduce the in-plant noise levels. However, these noise control measures are not always practical for reasons of maintenance access, heat buildup, space limitations, safety, etc. Therefore, although noise levels in some areas may exceed a sound level of 85 dBA, OSHA and Cal-OSHA noise exposure limits will be satisfied through the use of hearing protection within any areas that exceed 85 dBA.

8.5.4.3 Construction Noise Levels

The major construction phases consist of site clearing and preparation, foundation construction, building and equipment erection, site cleanup, and facility startup. Noise emissions will vary with each phase of construction, depending on the activity and the associated equipment.

Site clearing and preparation will require the use of heavy, diesel-powered earthmoving equipment. This equipment includes bulldozers, scrapers, dump trucks, and front-end loaders. Noise emissions during this phase will be dominated by the diesel engine noise. Site clearing and preparation activities will occur at all locations where facility equipment is to be installed.

Foundation construction will primarily involve concrete-handling equipment such as concrete trucks, mixers, vibrators, and pumps. Some earthmoving equipment will also be required to backfill the foundations.

The erection phase will involve mobile cranes, equipment delivery, impact wrenches, and air compressors. Because combustion turbine installation requires minimal onsite assembly, noise emissions during the erection phase are expected to be less than during other phases of construction. Similarly, site cleanup and facility startup will generally result in minimal noise emissions.

Construction activities will be scheduled during daytime periods (7:00 a.m. to 10:00 p.m.) to the extent possible. Some activities will require extended hours of operation, due to scheduling constraints or to maintain structural integrity of concrete pours. Nighttime construction will be limited to low-noise-producing activities to the extent possible.

The anticipated construction equipment noise levels and equipment usage are detailed in Table 8.5-6 (Bolt, Beranek, and Newman, Inc., 1977). The resulting construction noise levels at the nearest noise-sensitive receptor (NAS Lemoore housing) are anticipated to range from 45 to 50 dBA. These levels are expected to occur primarily during daytime periods and to be only faintly audible. Accordingly, construction noise is not anticipated to cause a disturbance to the nearby noise-sensitive receptors.

8.5.5 Equipment Design Features

The HPP incorporates the following noise reduction design features:

Combustion Turbine Generator Package

- Air inlet silencer
- Outdoor/weather enclosure
- Compartment ventilation silencers

Exhaust Stack Package

- Stack silencer

Transformer Package

- Low-noise unit or barrier wall

Fuel Gas Cooler Package

- Low-noise fans
- Barrier wall

Fuel Gas Compressor Package

- Enclosure
- Acoustically treated building ventilation

8.5.6 Mitigation Measures

8.5.6.1 Construction Noise

Where feasible, noisy construction activities will be scheduled during daytime periods. All engine-driven equipment will have mufflers or silencers that are in good working order. No other construction noise mitigation is necessary.

8.5.6.2 Worker Noise Exposure

The equipment noise design features described above will reduce the in-plant sound levels as well. Any locations determined to exceed 85 dBA will be posted as "high noise" areas, and hearing protection will be required within these areas, as required by state and federal Occupational Safety and Health Administration (OSHA) standards.

8.5.7 LORS Compliance

8.5.7.1 Federal

U.S. Environmental Protection Agency: The U.S. EPA has identified yearly day-night average sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise. The U.S. EPA emphasizes that since the protective sound levels were derived without concern for technical or economic feasibility, and contain a margin of

safety to ensure their protective value, they must not be viewed as standards, criteria, regulations, or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population will be at risk from any of the identified effects of noise. Additionally, the U.S. EPA has no authority to regulate ambient noise levels. According to the U.S. EPA, levels are sufficient to protect public health and welfare if they do not exceed an yearly average L_{dn} of 55 dBA outdoors and 45 dBA indoors in sensitive areas such as residences, schools, and hospitals (U.S. EPA, 1997).

U.S. Occupational Safety and Health Administration: OSHA has established maximum permissible worker noise exposure levels to protect against hearing damage. The level is based on a worker's noise exposure over a specific time period. For example, as stipulated in Title 29 of the Code of Federal Regulations, Part 1910, a worker cannot be exposed to an average sound level in excess of 90 dBA for over an eight-hour period. When noise exposure exceeds the permissible level, noise must be reduced through feasible engineering or administrative controls. When such controls fail to reduce the noise exposure to a permissible level, personal protective equipment must be provided and used to reduce the noise exposure. Additionally, when worker noise exposure exceeds 85 dBA over an eight-hour period, the employer must provide hearing protection and establish an annual audiometric testing program to track potential hearing loss. Therefore, OSHA requirements allow areas within facilities to exceed 85 dBA, provided that feasible noise control has been implemented and these areas are designated as high noise areas requiring hearing protection at all times.

Compliance with the OSHA noise exposure limits will be achieved by providing equipment noise mitigation and by identifying the high noise areas with warning signs that prescribe hearing protection.

8.5.7.2 State

California Department of Industrial Relations (Cal-OSHA): Cal-OSHA has established maximum permissible worker noise exposure levels to protect against hearing damage. The Cal-OSHA worker noise exposure limits are consistent with the federal OSHA limits (California Code of Regulations, Title 8, Subchapter 7).

Compliance with the Cal-OSHA noise exposure limits will be achieved by providing equipment noise mitigation and by identifying the high noise areas with warning signs that prescribe hearing protection.

California Environmental Quality Act (CEQA): CEQA requires lead agencies to evaluate whether a project will result in significant increases in ambient noise levels at sensitive receptors. Noise-sensitive receptors include residences, schools, churches, and hospitals. The California Energy Commission (CEC) staff's practice is to determine that an increase in ambient noise levels at sensitive receptors of 5 dB or less is not a significant noise impact.

Compliance with the CEC limit will be achieved by providing noise mitigation measures on the major equipment. The facility noise emissions are anticipated to increase the existing background sound levels by 0.5 dB, well below the CEC signifigance threshold.

8.5.7.3 County

Kings County General Plan – Noise Element: The State of California has not promulgated statewide environmental noise regulations, but rather charges each county to develop a noise element as part of its General Plan. The Kings County Noise Element establishes environmental noise limits based on the land use of the property receiving the noise. The allowable noise levels are outlined in Table 8.5-3 (Kings County, 1993). The limits listed in Table 8.5-3 include only those limits that potentially apply to the project.

As shown in Table 8.5-3, the environmental noise levels are classified as acceptable, conditionally acceptable, and unacceptable. Noise levels that fall in the conditionally acceptable range require specific approval from Kings County in order to be permissible.

The properties adjacent to the project site consist of agricultural and industrial uses. Accordingly, the acceptable environmental noise level at the boundary of these adjacent properties is less than L_{dn} 70 dBA. The nearest residential land use to the proposed site is the NAS Lemoore housing, located approximately 1.5 miles northeast of the site. While this housing consists predominantly of multiple-family dwellings, some are single-family residences.

The acceptable environmental noise level at the boundary of these residential land uses is less than L_{dn} 60 dBA.

Compliance with the Kings County limits will be achieved by including noise design features on the major equipment. The facility noise emissions are anticipated to contribute to future L_{dn} / CNEL sound levels of 69.4 / 69.6 dBA at the nearest adjacent property boundary and 47.9 / 48.1 dBA at the NAS Lemoore housing.

8.5.8 Agency Contacts

Agency	Contact/Title	Telephone
Kings County Planning Department 1400 W. Lacey Blvd. Hanford, CA 93230	William R. Zumwalt Director	(559) 582-3211

8.5.9 Schedule of Other Required Permits/Approvals

No permits or additional approvals are required.

8.5.10 Proposed Conditions of Certification

Proposed conditions of certification are contained in Appendix K. These conditions are proposed in order to ensure compliance with applicable LORS and/or to reduce potentially significant impacts to less-than-significant levels.

8.5.11 References

Bolt, Beranek, and Newman, Inc., 1977. *Power Plant Construction Noise Guide*. May.

California Code of Regulations (CCR), Title 8, Subchapter 7, Group 15.

CEC, 2000. California Energy Commission Regulations.

Code of Federal Regulations (CFR), Title 29, Part 1910, Subpart G.

Edison Electric Institute (EEI), 1984. *Electric Power Plant Environmental Noise Guide*. Volume I, 2nd Edition.

Kings County, 1993. Kings County General Plan Noise Element. December.

U.S. Environmental Protection Agency (U.S. EPA), 1977. *Toward a National Strategy for Noise Control*. April.

TABLES

Table 8.5-1
Descriptions of the Noise Measurement Locations

Noise Measurement Location	Description
1	Approximately 5,500 feet northeast of the site, adjacent to military base housing near the south end of NAS Lemoore.
2	Along 25th Avenue at the boundary of the proposed site.
3	Approximately 3,300 feet south of the site along 25th Avenue, adjacent to the closed New Star facility.

Table 8.5-2
Existing Ambient Sound Levels

Noise Measurement Location	$L_{eq\ (25hr)}$	L_{dn}	CNEL	L_{90} (lowest hourly)
1 (Residential)	63 dBA	67 dBA	67 dBA	41 dBA
2 (Site)	63 dBA	64 dBA	64 dBA	34 dBA
3	54 dBA	57 dBA	59 dBA	28 dBA

Table 8.5-3
Applicable Environmental Noise Level Limits
Established in the Noise Element of Kings County General Plan

Land Use Receptor	Exterior Noise Exposure Allowance, L_{dn}		
	Acceptable	Conditionally Acceptable	Unacceptable
Agricultural (Agricultural and Intensive Agricultural Uses)	< 70 dBA	70 to 75 dBA	> 75 dBA
Commercial (Retail Sales, Office Buildings, Professional Services, Commercial Business)	< 70 dBA	70 to 75 dBA	> 75 dBA
Industrial (Industrial, Manufacturing, Utility, and Waste Disposal Facilities)	< 70 dBA	70 to 75 dBA	> 75 dBA
Residential (Multiple Family)	< 65 dBA	65 to 70 dBA	> 70 dBA
Residential (Single Family)	< 60 dBA	60 to 70 dBA	> 70 dBA
Residential (Rural Residential)	< 65 dBA	65 to 70 dBA	> 70 dBA

Table 8.5-4
Major Equipment Sound Level Data

Equipment	Octave Band Sound Power Level, dB									Overall	Comments
	31.5	63	125	250	500	1K	2K	4K	8K	dBA	
CTG Package	114	111	108	103	97	92	89	85	83	100	No tonal noise emissions.
Exhaust Stack Package	118	112	102	96	97	95	87	86	83	99	No tonal noise emissions.
Transformer	99	104	105	103	97	89	83	77	69	98	Transformers tend to radiate a 120-hertz tone. However, the tone will be inaudible at noise sensitive receptors.
Fuel Gas Cooler	106	104	101	89	82	80	72	66	60	88	No tonal noise emissions.
Fuel Gas Compressor	114	114	112	111	110	109	108	107	103	115	Located within enclosure.

Table 8.5-5
Predicted Future Background Sound Level during Normal Operation of the Proposed Facility

Receptor	Measured Background Sound Level (L_{90})	Predicted Facility Sound Level	Future Background Sound Level with Facility	Increase in Future Background Sound Level
NAS Lemoore Housing	41.0 dBA	32.0 dBA	41.5 dBA	0.5 dB

Table 8.5-6
Construction Equipment Noise Emission Levels

Construction Phase	Equipment	Sound Pressure Level @ 50 ft, dBA	Quantity	Acoustic Usage Factor, dB	Equivalent Sound Pressure Level @ 50 ft, dBA
Clearing	Backhoe	83	2	-6	80
	Grader	85	2	-6	82
	Trencher	85	1	-6	79
	Dozer	87	2	-5	85
	Front-End Loader	84	2	-5	82
	Compactor	80	2	-3	80
	Mobile Crane	83	1	-8	75
	Truck, Large	85	4	-5	86
	Diesel Generator	79	1	-8	71
	TOTAL				**91**
Foundation	Backhoe	83	2	-6	80
	Front-End Loader	84	1	-5	79
	Dozer	87	1	-5	82
	Trencher	85	1	-6	79
	Mobile Crane	83	2	-8	78
	Stationary Crane	85	1	-13	72
	Truck, Large	85	2	-5	83
	Concrete Mix Trucks	85	2	-5	83
	Concrete Pump	80	1	-8	72
	Concrete Vibrator	76	4	-8	74
	Diesel Generator	79	1	-8	71
	TOTAL				**88**
Erection	Backhoe	83	2	-6	80
	Trencher	85	1	-6	79
	Mobile Crane	83	2	-8	78
	Stationary Crane	85	4	-13	78
	Truck, Large	85	4	-5	86
	Diesel Generator	79	1	-8	71
	Pneumatic Tools	85	7	-8	85
	Air Compressors	85	2	-7	81
	TOTAL				**91**
Startup/Site Cleanup	Dozer	87	1	-5	82
	Trencher	85	1	-6	79
	Mobile Crane	83	1	-8	75
	Truck, Large	85	2	-5	83
	Diesel Generator	79	1	-8	71
	Pneumatic Tools	85	2	-8	80
	Air Compressors	85	1	-7	78
	TOTAL				**88**

Table 8.5-7
Laws, Ordinances, Regulations, and Standards Applicable to Noise

LORS	Applicability	AFC Conformance Section
Federal		
U.S. EPA 1974 Noise Guidelines	Guidelines for state and local governments.	N/A
The Occupational Safety and Health Act of 1970 (OSHA), (29 CFR § 1919 et seq.)	Guidelines for exposure of workers to noise during construction and operations.	8.5.7.1
Noise Control Act (1972) as amended by the Quiet Communities Act (1978); (42 USC 4901–4918)	Separate noise-sensitive areas are encouraged.	N/A
State		
Rules of Practice and Procedure & Power Plant Site Certification Regulations (CEC, 2000)	Defines noise impacts at residential/recreational receptors in relation to an increase over pre-existing background noise levels.	8.5.7.2
Cal-OSHA Occupational Noise Exposure Regulations (8 CCR, General Industrial Safety Orders, Article 105, Control of Noise Exposure, § 5095, et seq.)	Sets employee noise exposure limits. Equivalent to federal OSHA standards.	8.5.7.2
California Noise Control Act of 1973 (California Health and Safety Code, Division 28)	Comply with local noise ordinances.	N/A
Local		
Kings County, General Plan Noise Element, 1993	Establishes environmental noise limits based on the land use of the property receiving the noise. Noise levels are classified as acceptable, conditionally acceptable, and unacceptable. Acceptable noise level of <70 dBA for industrial/agricultural land uses, and <65 dBA for multiple-family residential, <60 dBA for single-family residential.	8.5.7.3

FIGURES